

- 1     1.     An optical switch device, comprising:  
 2             a switch fabric;  
 3             a plurality of input ports through which incoming data passes to the switch fabric;  
 4             a plurality of output ports through which outgoing data passes from the switch  
 5     fabric;  
 6             a first demultiplexing device coupled to at least one of the plurality of input ports;  
 7             a signal generator coupled to the first demultiplexing device for injecting data into  
 8     the switch fabric; and  
 9             a first multiplexing device coupled to at least one of the plurality of output ports;  
 10     and  
 11             a first signal analyzer coupled to the first multiplexing device for analyzing the  
 12     data injected by the signal generator.
  
- 1     2.     The device according to claim 1, further including a second signal analyzer  
 2             coupled to the first multiplexing switch and a multiplexer coupled between the  
 3             first and second analyzers and the first multiplexing device.
  
- 1     3.     The device according to claim 1, further including a second demultiplexing device  
 2             coupled to at least one of the plurality of input ports and a second signal analyzer  
 3             coupled to the second demultiplexing switch for analyzing data extracted from the  
 4             input ports on a polling basis.
  
- 1     4.     The device according to claim 1, wherein the switch fabric includes first and  
 2             second switch fabrics.
  
- 1     5.     The device according to claim 1, wherein at least one of the plurality of input  
 2             ports includes a splitter for splitting a signal incoming to the at least one input port  
 3             into first and second signal, wherein the first signal is received by the first switch  
 4             fabric and the second signal is received by the second switch fabric.

- 1 6. The device according to claim 5, wherein at least one of the plurality of output  
2 ports can receive signals from each of the first and second switch fabrics.
- 1 7. The device according to claim 6, further including at least one signal analyzer  
2 coupled to one or more of the plurality of output ports for analyzing data from the  
3 first and second switch fabrics.
- 1 8. The device according to claim 1, further including an add/drop multiplexer  
2 coupled to the switch fabric.
- 1 9. A method for achieving bit level access to data in an optical switch, comprising:  
2 injecting a signal from a first signal generator into a switch fabric via a first  
3 demultiplexing device;  
4 extracting the first signal via a multiplexing switch and analyzing the extracted  
5 first signal.
- 1 10. The method according to claim 9, further including verifying a connection  
2 between an input port of the optical switch and an output port of the optical switch  
3 from the extracted first signal.
- 1 11. An optical communication system, comprising:  
2 a first optical switch having a plurality of input and output ports;  
3 a first optical network coupled to the first optical switch, the first optical network  
4 including a first transponder corresponding to a first termination point for signals  
5 traveling from the first optical network to the first optical switch and a second  
6 transponders corresponding to a second termination point;  
7 a second optical network coupled to the first optical network, the second optical  
8 network including a first transponder corresponding to a first termination point and a  
9 second transponder corresponding to a second termination point; and

a second optical switch coupled to the second optical network,  
wherein at least the first transponder in the first optical network can insert an  
unequipped signal into the first optical network.

12. The system according to claim 11, wherein the first switch can loop back an  
unequipped signal injected by the first transponder in the first optical network.

13. The system according to claim 12, wherein the first transponder in the first optical  
network injects an unequipped signal in a direction towards the first optical  
switch.

14. The system according to claim 11, wherein a first input port of the first switch, the  
first termination point in the first optical network, the first termination point in the  
second optical network and a first input port of the second switch define a  
connection between the first and second switches.

15. The system according to claim 14, wherein a first output port of the first switch,  
the second termination point of the first optical network, the second termination  
point of the second optical network, and a first input port of the second switch  
define a further connection between the first and second switches.

16. A method of generating unequipped signals in an optical switch, comprising:  
inserting an unequipped signal and port ID information and an unequipped status  
indication into overhead bytes of the unequipped signal by a first WDM port in a first  
WDM system coupled to an input port of a first optical switch;  
connecting an output port in the first optical switch to the input port in the first  
switch connected;  
reading the inserted port ID information at a second WDM port in the first WDM  
system coupled to the first optical switch output port;

9 determining whether the port ID read by the second WDM port matches a port ID  
10 of the first WDM port of the first WDM system; and  
11 continuing to insert the unequipped signal at the first WDM port in the first WDM  
12 system when the port ID matches; and  
13 discontinuing insertion of the unequipped signal when the read port ID does not  
14 match.

1 17. The method according to claim 16, further including receiving the unequipped  
2 signal at an output port of a second optical switch via a signal path through the  
3 output port of the first optical switch, the second port of the first WDM system,  
4 and a second WDM system.

1 18. A method of automatically determining network topology in an optical network  
2 having optical switch, comprising:  
3 coupling first and second optical switches via a WDM system such that a first  
4 input port of the first optical switch is connected to a first output port of the second  
5 optical switch via first and second ports in the WDM system to provide a first signal path  
6 and a first output port of the first optical switch is coupled to a first input port of the  
7 second optical switch via third and fourth ports of the WDM system to provide a second  
8 signal path;  
9 inserting IDs of the first port, the second port, the first optical switch input port,  
10 and the third port into an optical signal in the first signal path;  
11 inserting IDs of the second switch input port, the fourth port, the third port and the  
12 first port into an optical signal in the second signal path; and  
13 identifying a connection between the first optical switch input port and an output  
14 port of the second optical switch and a connection between an output port of the first  
15 optical switch and the input port of the second optical switch based upon a commonality  
16 of the first port and the fourth port in the first and second signal paths.

1 19. The method according to claim 18, further including inserting the second and  
2 third port IDs with a transponder at the second port.

1 20. The method according to claim 18, further including exchanging port ID  
2 information between the first and second optical switches via an out of band  
3 channel.